

Smart Adaptive Flight Effective Cue (SAFE-Cue), Phase II

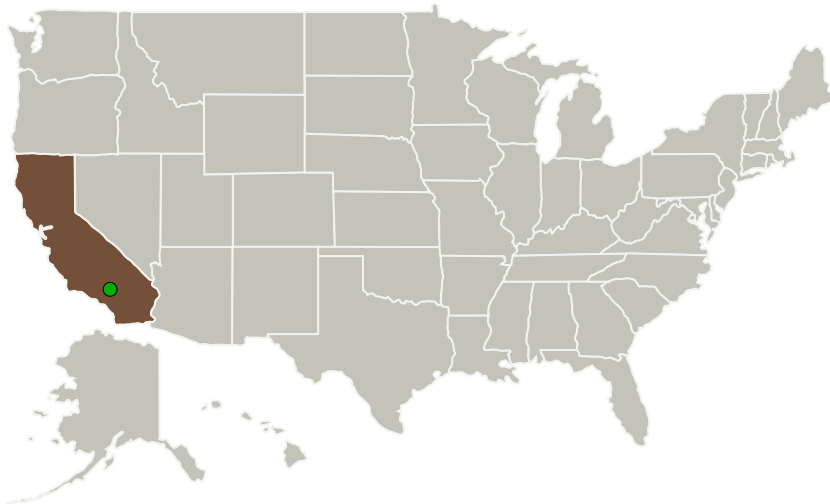
Completed Technology Project (2011 - 2014)



Project Introduction

To enhance aviation safety, numerous adaptive control techniques have been developed to maintain aircraft stability and performance in the presence of failures or damage. Flight evaluations of various adaptive controllers conducted by NASA and others have shown great promise. In some cases unfavorable pilot-vehicle interactions including pilot-induced oscillations have occurred. Susceptibility to such interactions is more likely when the pilot interacts with a highly nonlinear vehicle that may no longer have predictable response characteristics. To alleviate these unfavorable interactions, Systems Technology, Inc. proposes the Smart Adaptive Flight Effective Cue or SAFE-Cue. This innovative system provides force feedback to the pilot via an active control inceptor with corresponding command path gain adjustments. The SAFE-Cue alerts the pilot that the adaptive control system is active, provides guidance via force feedback cues, and attenuates commands, thus ensuring pilot-vehicle system stability and performance in the presence of damage or failures. Phase 2 will build upon a successful Phase 1 demonstration wherein SAFE-Cue configurations eliminated pilot-vehicle system oscillation tendencies allowing the evaluation pilots to focus on the task rather than maintaining control. In this proposed program, a prototype SAFE-Cue will be developed and evaluated with exemplar adaptive controllers using the Calspan Learjet In-Flight Simulator.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Systems Technology, Inc	Lead Organization	Industry	
● Armstrong Flight Research Center(AFRC)	Supporting Organization	NASA Center	Edwards, California

Primary U.S. Work Locations

California

Project Transitions

**June 2011:** Project Start**March 2014:** Closed out**Closeout Documentation:**

- Final Summary Chart(<https://techport.nasa.gov/file/139345>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Systems Technology, Inc

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

David H Klyde

Co-Investigator:

David Klyde

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Technology Maturity (TRL)

Start: 4
Current: 6
Estimated End: 6



Technology Areas

Primary:

- TX10 Autonomous Systems
 - └ TX10.4 Engineering and Integrity
 - └ TX10.4.1 Verification and Validation of Autonomous Systems

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System